

REMARKS

The Office Action dated December 1, 2006 has been carefully considered. Claim 1 has been amended. Claims 1, 2 and 4 are in this application.

The previously presented claims were rejected under 35 U.S.C. § 103 as obvious in view of previously presented U.S. Patent No. 3,904,652 to Frank in combination with U.S. Patent No. 3,366,648 to Kerr. Applicants respectfully submit that the teachings of these references do not teach or suggest the invention defined by the present claims.

Claim 1 has been amended to more specifically define the concentration of the raw material. Support for this amendment is found throughout the specification and in particular on page 12, line 7 through page 14, line 4. No new matter has been added.

The Examiner states that it would have been obvious to the skilled artisan in the art to be motivated to incorporate Kerr's safe concentration of the raw material and absorption procedure into the Frank process. However, Applicants submit that neither of the references teach the limitations of the present claims and do not disclose or suggest the advantages achieved by the limitations of the present claims.

Frank discloses the importance of maintaining an oxygen concentration in the reaction zone below the flammable limit. For example, Frank states that "maintaining a concentration of oxygen in the reaction zone below the flammable limit"(col. 1, lines 43-45), that "In order to maintain the oxygen concentration below the lower limit" (col. 3, lines 56-57), that "the oxygen concentration must be below 13%, the flammable limit for the butane-oxygen-nitrogen system" (col. 3, lines 64-66), and that "It is of major importance in the practice of the invention to maintain the oxygen below the flammable limit of the system" (col. 4, lines 57-59).

In contrast to Frank, the claims of the present invention recite that during start up of the reactor, the concentration of the raw material is less than the lower explosion limit and the concentration of oxygen is not less than the limiting oxygen concentration (excluding 0% of concentration of raw material). Frank does not disclose or suggest the idea that the oxygen concentration is set not less than the flammable limit of the system when the concentration of the raw material is less than the concentration of the lower explosion limit of the raw material. As described on page 10, lines 11-19, it has been found that the concentration of oxygen can be

above the flammable limit when the concentration of the raw material is less than the concentration of the lower explosion limit of the raw material. Rather, Frank teaches away from the present invention by teaching that it is always preferable to maintain the oxygen concentration below the flammable limit of the system without relation to the concentration of the raw material.

Furthermore, one of ordinary skill in the art could not predict from Frank the effect derived of the present invention from setting the oxygen concentration not less than the limiting oxygen concentration during starting up of the reactor. As described on page 10, lines 20-24, by supplying the reactor a gas having a concentration of oxygen not less than the limiting oxygen concentration it is possible to decrease the amount of diluting gas to be used and to shorten the duration of the operation of starting up the reactor. There is no teaching or suggestion of these advantages in Frank.

Kerr discloses a technique relating to a steady reaction for producing maleic acid and discloses that "The gaseous feed stream to the oxidation reactors normally will contain air and about 0.5 to about 2.5 mol percent hydrocarbons such as butane" (col. 5, lines 69-71) and that "Although higher concentrations may be employed, explosive hazards may be encountered" (col. 5, lines 73-75). Furthermore, there can be no doubt that the concentration of hydrocarbons (about 0.5-2.5 mol%) is that of steady state.

In contrast to the invention defined by the present claims, Kerr does not teach or suggest that during start up of the reactor the concentration of the raw material is less than the lower explosion limit and the oxygen concentration is not less than the limiting oxygen concentration and does not cure the deficiencies of Frank noted above. Further, Kerr does not teach or suggest that for reaching steady state causing a range in which the concentration of the raw material is not less than the concentration of the lower explosion limit of the raw material and the concentration of oxygen is less than the limiting oxygen concentration. For the Examiner's reference, Applicants submit marked up Fig. 1 showing that in reaching steady state the concentration of the raw material is not less than the concentration of the lower explosion limit of the raw material. Fig. 1 also shows passing across the border line where the concentration of oxygen is the limiting oxygen concentration. As described on page 4, lines 24-30, the

adjustment of the concentration of raw material to increase above the explosion range of the raw material increases the amount of raw material supplied for oxidation for the purpose of helping the concentration of the raw material or to decrease the amount of the molecular oxygen-containing gas to be supplied for decreasing the concentration of oxygen. There is no teaching or suggestion in Kerr of these advantages. Rather, Kerr teaches away from the present invention by teaching a safe concentration of the raw material should be used to prevent explosion. Moreover, Kerr does not disclose or suggest any specific measure to prevent the explosive hazards when using higher concentration of the raw material, such as decreasing the oxygen concentration. Therefore one of ordinary skill in the art could also not predict the effect of the present invention.

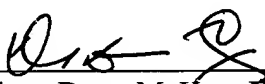
Applicants submit that the gas composition is changed during starting up of the reactor from oxygen-rich zone, which is not disclosed or suggested in Frank, to reaching steady state in a raw material-rich zone, which is not disclosed or suggested in Kerr. Accordingly, the invention defined by the present claims is not obvious in view of Frank in combination with Kerr. Dependent claim 2 is believed to be allowable for the same reasons that claim 1 is allowable.

With regard to claim 4, neither Frank nor Kerr teach a method for preparing feed raw material, characterized by supplying the discharged gas obtained at a step of absorption to the reactor thereby causing the concentration of the raw material and the concentration of oxygen to fall in a range in which the concentration of the raw material is less than the concentration of the lower explosion limit of the raw material and the concentration of oxygen is not less than the limiting oxygen concentration corresponding to the lowest concentration of oxygen forming an explosion range. Accordingly, the invention defined by claim 4 is not obvious in view of Frank in combination with Kerr.

The application is now believed to be in a condition for allowance and an early notification thereof is respectfully requested. If the Amendment does not place the case in condition for allowance, Applicant requests that the Examiner contact the undersigned. It is believed no fee is required. The Commissioner is authorized to charge any deficiency or credit any overpayment to Deposit Account No. 13-2165.

Respectfully submitted,

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